# LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

# LACASSINE POOL

WATERBODY EVALUATION & RECOMMENDATIONS

## CHRONOLOGY

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# WATERBODY EVALUATION

## STRATEGY STATEMENT

### Recreational

Lacassine Pool is part of Lacassine National Wildlife Refuge, a United States Fish and Wildlife Service (USFWS) migratory bird refuge. Their stated fisheries management objective from the 2007 Lacassine Comprehensive Conservation Plan (CCP) is as follows:

"*Objective B-8: Fisheries - In cooperation with the Louisiana Department of Wildlife and Fisheries and other partners, manage habitat consistent with the purposes of the refuge, and monitor and seek ways to improve water quality and fishery resources to benefit migratory birds, fish, and other wildlife*" (USFWS 2007).

The Louisiana Department of Wildlife and Fisheries (LDWF) will work with the USFWS to maximize public fishing opportunities for all recreational species in Lacassine Pool.

### Commercial

Commercial fishing is prohibited in Lacassine Pool.

### Species of Special Concern

No threatened, endangered or fish species of concern occur naturally within Lacassine Pool.

## EXISTING HARVEST REGULATIONS

### Recreational

Statewide regulations apply to all fish species. The Louisiana recreational fishing regulations may be viewed at the following link: http://www.wlf.louisiana.gov/fishing/regulations

Additional USFWS restrictions apply and may be viewed at the following link: http://www.fws.gov/southeast/pubs/SWLAcomplex_Fish.pdf

### Commercial

Commercial fishing is prohibited in Lacassine Pool.

## SPECIES EVALUATION

### Recreational

*Largemouth bass*

Electrofishing is the predominant sampling technique used to assess largemouth bass (LMB) relative abundance (catch per unit effort = CPUE) and size distribution in Lacassine Pool. Data collected during spring electrofishing are used to describe population trends, age composition, growth rate, mortality rate and the genetic composition of a LMB population.

### Largemouth bass size distribution, relative weight, and relative abundance

Length frequencies generated from standardized sampling results from 2002-2011 show that roughly half (55.5%) of the LMB in Lacassine Pool were less than 10" total length (TL) over that time period (Figure 1). Distinct peaks in abundance are seen at 6" and 10" TL indicating abundant age 1 and age 2 LMB. A distinct shift in size structure can be seen from 2012-2016 where inch groups 4 and 5 are most abundant (Figure 2). These increased inch groups have remained high several years after reduced recruitment due to drought conditions (2010-2011). Figure 2 also shows two size classes of fish that have decreased. The first is between 5 and 6 inches, and observations suggest this is due to predators in this harsh environment. The second is at the 11 to 12 inch mark. This decrease is believed to be linked to harvest. Mean relative weight (Wr) by inch group are near or above 90 for all inch groups through all years indicating adequate forage availability (Figures 1 and 2). A distinct upward trend in Wr is apparent starting at 12" TL from 2002-2011. This trend may be due to timing of samples (pre-spawn), bass reaching sexual maturity, or an increase in forage availability with increasing size (i.e. they are now predator and not prey). Size distribution in Figure 1 shows a stable population over a ten year period; however Figure 2 suggests an unstable population still lacking recruitment into all age classes after years of drought, hurricanes, and suppressed spawning/recruitment.

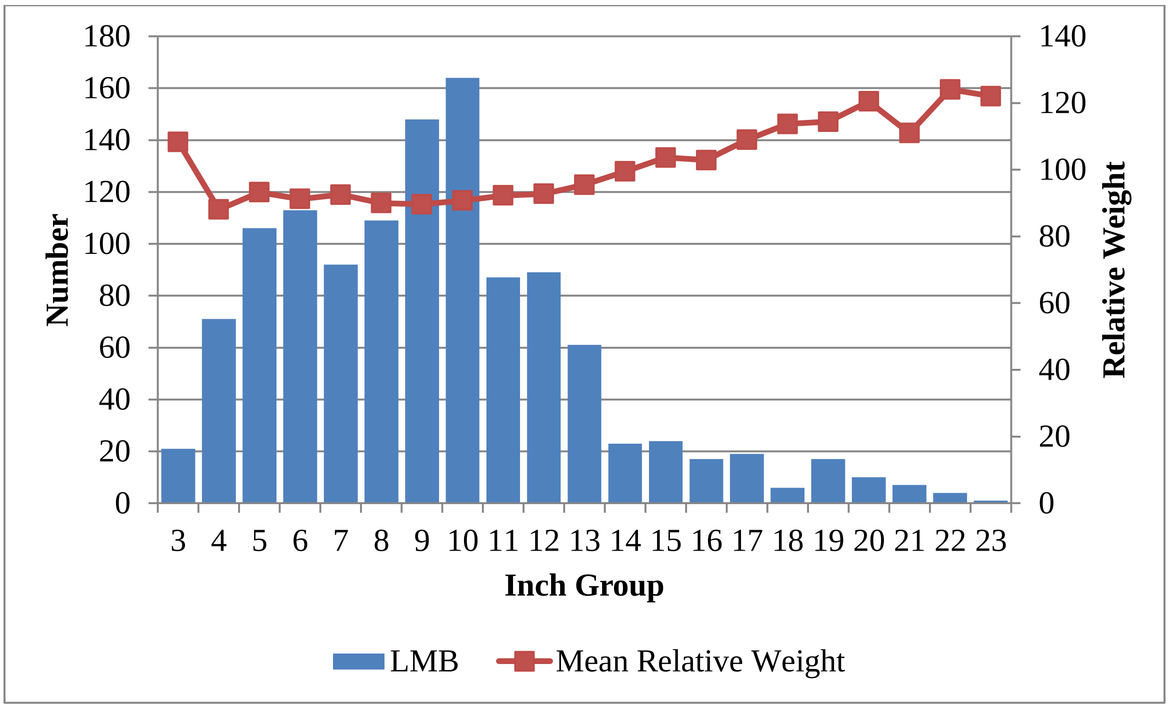


Figure 1. Size distribution (inch groups) and mean Wr by inch group of largemouth bass collected in standardized electrofishing samples from Lacassine Pool, LA 2002-2011 (n=1,189).

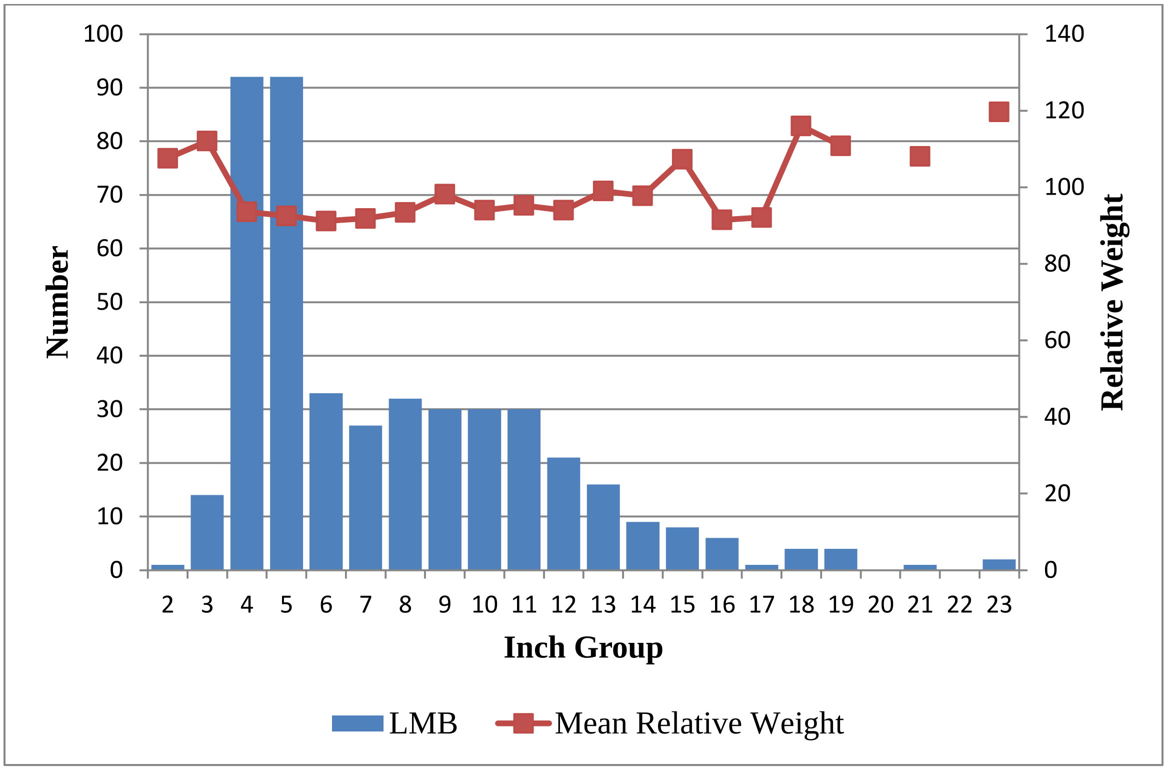


Figure 2. Size distribution (inch groups) and mean Wr by inch group of largemouth bass collected in standardized electrofishing samples from Lacassine Pool, LA 2012-2016 (n=453).

Electrofishing sampling in Lacassine Pool is typically conducted in winter/spring prior to the March 15th opening of fishing season. Effects of the 1999-2000 drought were apparent in 2002 when the lowest observed CPUE (10.6 bass/hour) was recorded (Figure 3). Total catch rates returned to pre-drought levels in 2003, and remained similar through 2005. Despite protective regulations on LMB from 2001-2004 (Part A, Table 2), overall abundance and abundance of quality-size fish did not increase significantly until after the protective regulations were removed in 2005. Sampling was conducted prior to the opening of the 2005 fishing season. Therefore, 2005 results should be considered with 2002-2004 results. In 2007, while overall abundance increased, reduced catch rates of larger fish (≥12” TL) were recorded. This may be indicative that anoxic conditions associated with Hurricane Rita in 2005 disproportionately affected larger fish and/or reduced recruitment that year. Decreased recruitment during more recent drought conditions (2010-2011) resulted in decreased abundance of sub-stock LMB in 2011 and 2012 electrofishing samples (Figure 3). Increased recruitment in 2012 following the 2011 drought is apparent in record high catch rates of sub-stock LMB in 2013. This demonstrates the ability of LMB stocks to rapidly repopulate following environmental impacts, provided some adult fish remain in the population. While approximately 51,000 Florida largemouth bass (FLMB) fingerlings were stocked in 2012 (Part A, Table 7), this number of fish is inadequate to account for the substantial increase in catch rates observed in 2013. The abundance of sub-stock LMB should have led to a corresponding increase in stock-sized LMB in 2014, but no such increase was recorded (Figure 3). This may be indicative of significant mortality in that cohort, or a result of sampling bias. The CPUEs for 2015 and 2016 are very similar and may reflect a more stable population for now and the near future, barring another environmental impact (hurricane, drought, etc…).

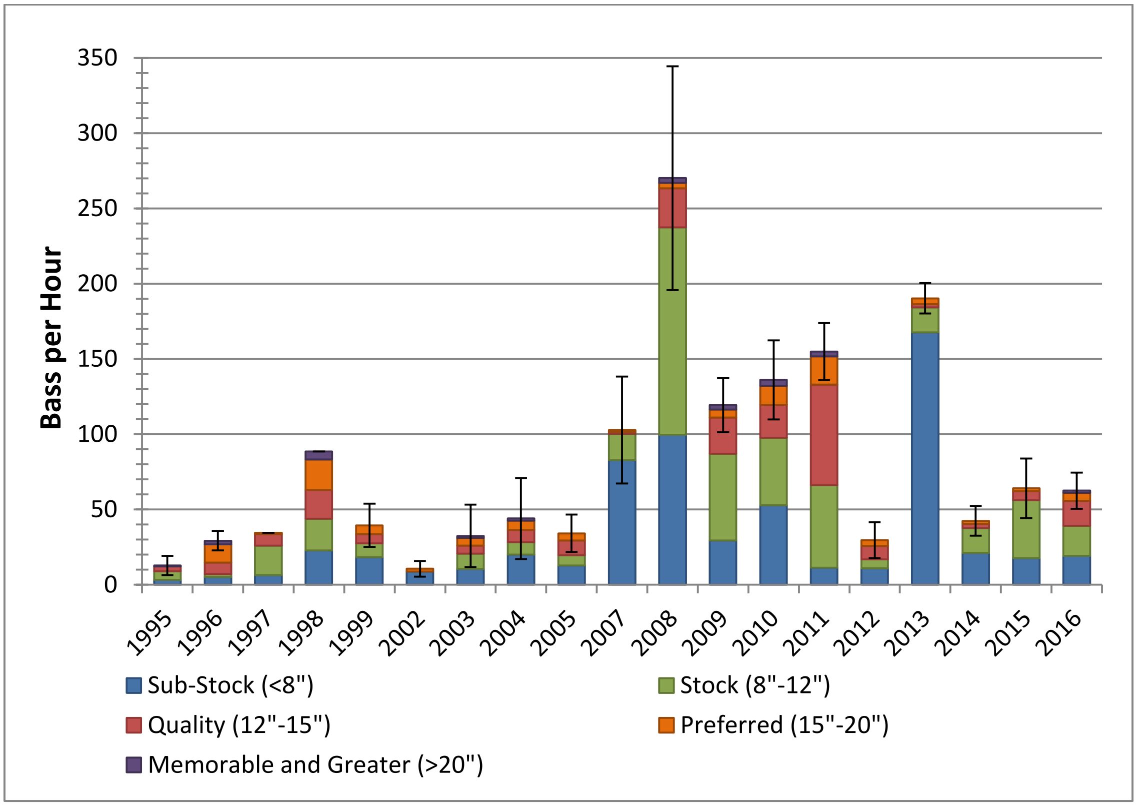


Figure 3. Mean CPUE (+ SE) for largemouth bass by size class from standardized spring electrofishing samples 1995-2016 for Lacassine Pool, LA. Error bars represent standard error of total mean CPUE.

Size structure indices

Proportional stock density (PSD) and relative stock density (RSD) are indices used to numerically describe length-frequency data (Anderson and Neumann 1996). Proportional stock density compares the number of fish of quality size (greater than 12 inches for largemouth bass) to the number of bass of stock size (greater than 8 inches in length), and is calculated by the formula:

$$PSD = \frac{\text{Number of bass} \geq 12 \text{ inches}}{\text{Number of bass} \geq 8 \text{ inches}} \times 100$$

PSD is expressed as a percentage. A fish population with a high PSD consists mainly of larger individuals. A population with a low PSD consists mainly of smaller fish. Values between 40 and 70 indicate a balanced bass population. In Lacassine Pool, PSD values from 1995-1999 (pre-drought) ranged from 30% to 92%, with three of those five years between 40% and 70% (Figure 4). In 2002, no fish 8”-12” TL and two fish larger than 12” TL were captured, resulting in a PSD value of 100%. From 2003-2005, PSD values ranged from 53% to 70%, and from 2007-2012 ranged from 13% to 68%. These calculations indicate a normally distributed bass population in most years. Both low (13%) and high (100%) values outside of the optimum range are likely indicative of unstable recruitment and population shifts resulting from environmental impacts (droughts/hurricanes). The PSD values from 2013 (26%) and 2014 (22%) indicate a population dominated by smaller fish, a condition likely due to increased 2012 recruitment (Figure 4). Values in 2015 (17%) still show the population is comprised mainly of small individuals, whereas 2016 values of 54% are in the ideal range. The large change could be explained by the population being more in balance, but it likely reflects changes in sample efficiency (examples: collecting more large fish due to water temperature and excess vegetation effecting the visibility of fish during sampling).

Relative stock density ($RSD_{15}$) is the percentage of largemouth bass in a stock (fish over 8 inches) that are 15 inches TL or longer, and is calculated by the formula:

$$RSD_{15} = \frac{\text{Number of bass} \geq 15 \text{ inches}}{\text{Number of bass} \geq 8 \text{ inches}} \quad X\ 100$$

$RSD_{15}$ values between 10 and 40 indicate a bass population with normal size distribution, while values between 30 and 60 indicate a higher percentage of larger fish. From 1995-1999, $RSD_{15}$ values fluctuated significantly from year to year (Figure 4). Since 2003, $RSD_{15}$ values have been more stable and tend to fluctuate in 3 to 5 year cycles instead of annually. Since 2003, $RSD_{15}$ values have ranged from 4% to 33%, indicating the population with normal size distribution with a few exceptions (2007, 2008, 2009, 2014, and 2015).

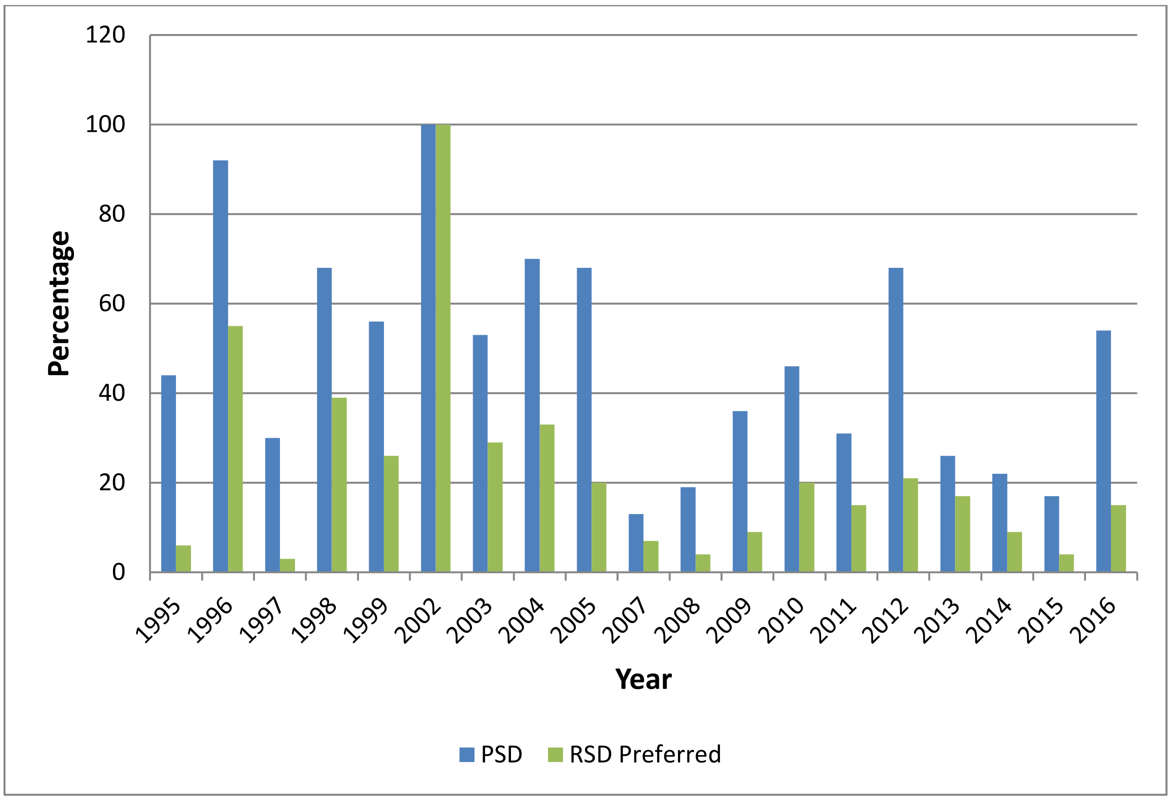


Figure 4. Proportional stock density and relative stock density (preferred) for largemouth bass on Lacassine Pool, LA, from spring electrofishing results, 1995 – 2016.

<u>Age and growth</u>

Results of age and growth analyses indicate LMB in Lacassine Pool reach 12” (305mm) TL in 2.3 years on average. Individual LMB show highly variable growth rates with age two fish ranging from 6”-16” TL. Differences in growth are apparent when Lacassine Pool growth models are compared to statewide growth models (Figure 5). The Lacassine Pool growth curve is slightly below the statewide average to age 3, and above the statewide average beyond age 4. The exact differences in growth rates are found in Table 1. Lacassine bass grow 8.8% slower than average to 11” TL (age 2), then 7.1% faster than average to 17” TL (age 4.2). By 20” TL (age 6), LMB in Lacassine Pool have grown 28.7% faster than average. This may be an effect of the aquatic plant coverage, where the abundance of submersed vegetation delays the onset of piscivory in juvenile bass diets leading to slower growth rates in juvenile fish (Bettoli et al. 1992, Hoyer and Canfield 1996). Age 1 LMB are the most abundant by number during spring sampling in most LMB populations in LA (unpublished data, LDWF). However, in Lacassine Pool, age 2 LMB are usually the most abundant. This may be attributable to gear selectivity where age 1 LMB in Lacassine Pool are not fully recruited to reliable capture by boat mounted electrofishing equipment.

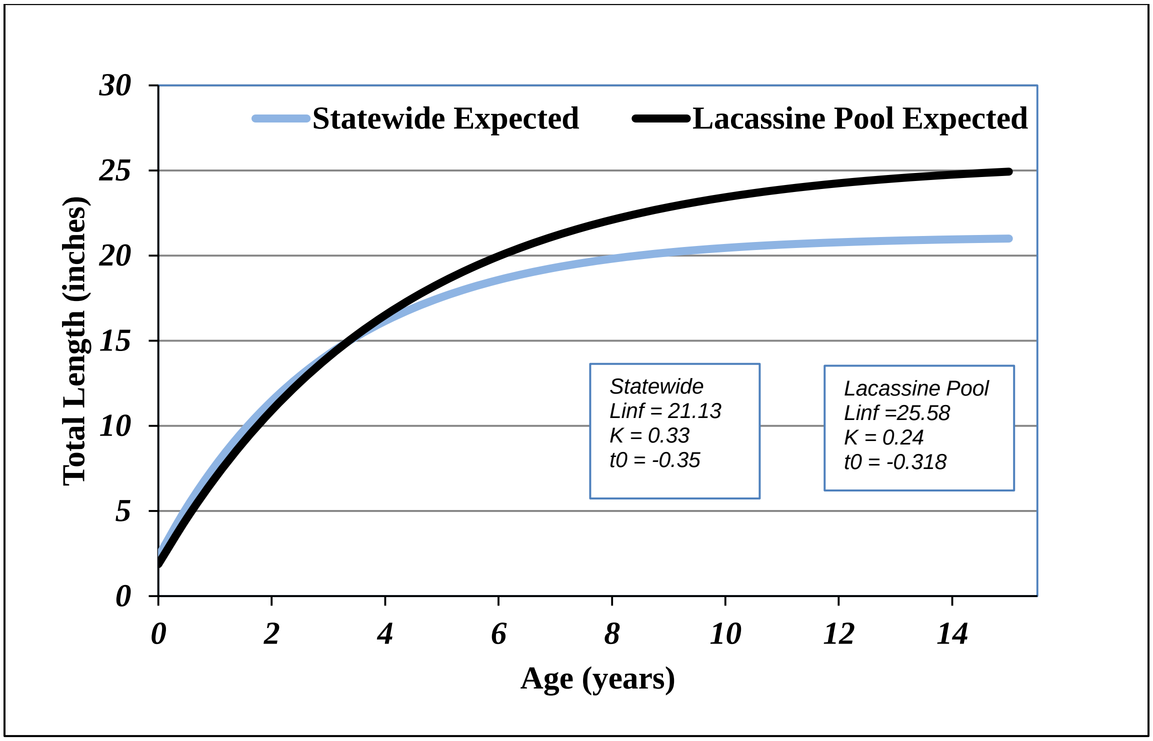


Figure 5. Von Bertalanffy growth models for LMB from Lacassine Pool from 2008-2009 (n=539) and statewide collections from 2009-2013 (n=11,672).

Table 1. Estimated time required for LMB to reach specified lengths and percent difference between statewide and Lacassine Pool based on Von Bertalanffy growth models.

| Length (in) | Statewide Average Time (years) | Lacassine Pool Time (years) | Difference in Time |
|---|---|---|---|
| 7 | 0.9 | 1.0 | -18% |
| 11 | 1.9 | 2.0 | -8.8% |
| 14 | 2.9 | 3.0 | -2.3% |
| 17 | 4.6 | 4.2 | 7.1% |
| 18 | 5.4 | 4.8 | 11.9% |
| 20 | 8.5 | 6.0 | 28.7% |

Largemouth bass genetics

Largemouth bass tissue samples are collected periodically in conjunction with standardized age and growth samples to determine genetic composition of the largemouth bass population (Table 2). Electrophoresis of liver tissues is conducted at the Louisiana State University School of Renewable Natural Resources genetics laboratory. Total FLMB influence over 80% was recorded in 2003 and 2004. This high level of gene introgression may be due to a combination of increased stocking success following the 1999-2000 droughts, and the habitat similarities between Lacassine Pool and the swamp/marsh ecosystems of Florida. Pre-drought analysis (1997) also showed a high (63%) total FLMB influence, indicating FLMB stockings are very successful in Lacassine Pool under normal conditions. The most recent analyses conducted in 2008 and 2009 showed a roughly even distribution between total FLMB and northern genomes in the bass population (56% and 52% total influence respectively).

Table 2. Genetic analysis results for largemouth bass sampled in Lacassine Pool, LA 1997-2009.

| Year | Number | Northern | Florida | Hybrid | Florida Influence |
|---|---|---|---|---|---|
| 1997 | 30 | 37% | 33% | 30% | 63% |
| 2003 | 32 | 16% | 42% | 42% | 84% |
| 2004 | 54 | 19% | 31% | 50% | 81% |
| 2008 | 212 | 44% | 17% | 39% | 56% |
| 2009 | 112 | 48% | 21% | 31% | 52% |

*Forage*

Forage availability for bass is typically measured directly through electrofishing and indirectly through measurement of body condition or relative weight. Sunfishes (*Lepomis* spp.) comprise the majority of the vertebrate forage base in Lacassine Pool (Figure 6). Invertebrates such as aquatic insect larvae, crawfish, and grass shrimp are also important food items for juvenile bass.

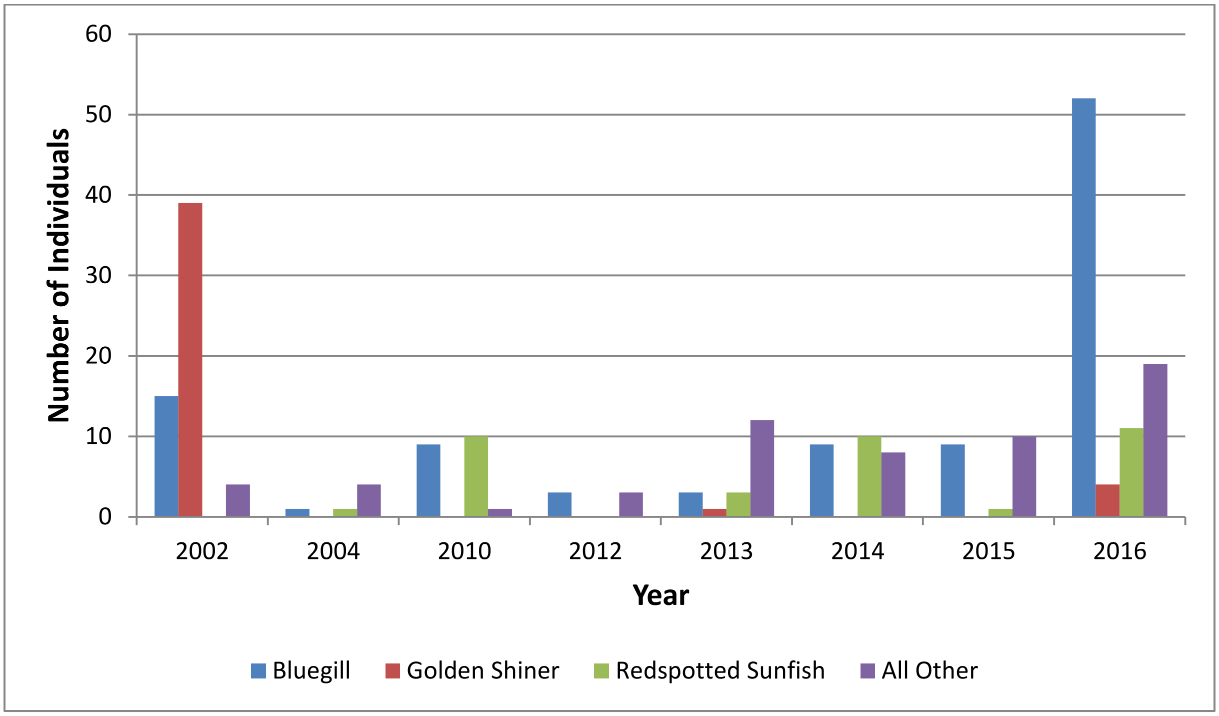


Figure 6. Number of bluegill, golden shiner, redspotted sunfish, and all other forage species less than 6 inches TL captured in standardized spring forage electrofishing samples from 2002 - 2016 on Lacassine Pool, LA.

*Crappie*

While both black (*Pomoxis nigromaculatus*) and white crappie (*P. annularis*) can be found in Lacassine Pool, black crappie are the predominant species. A total of 94.5% of all black crappies collected in electrofishing samples from 2002-2016 were less than 10" TL (Figure 7).

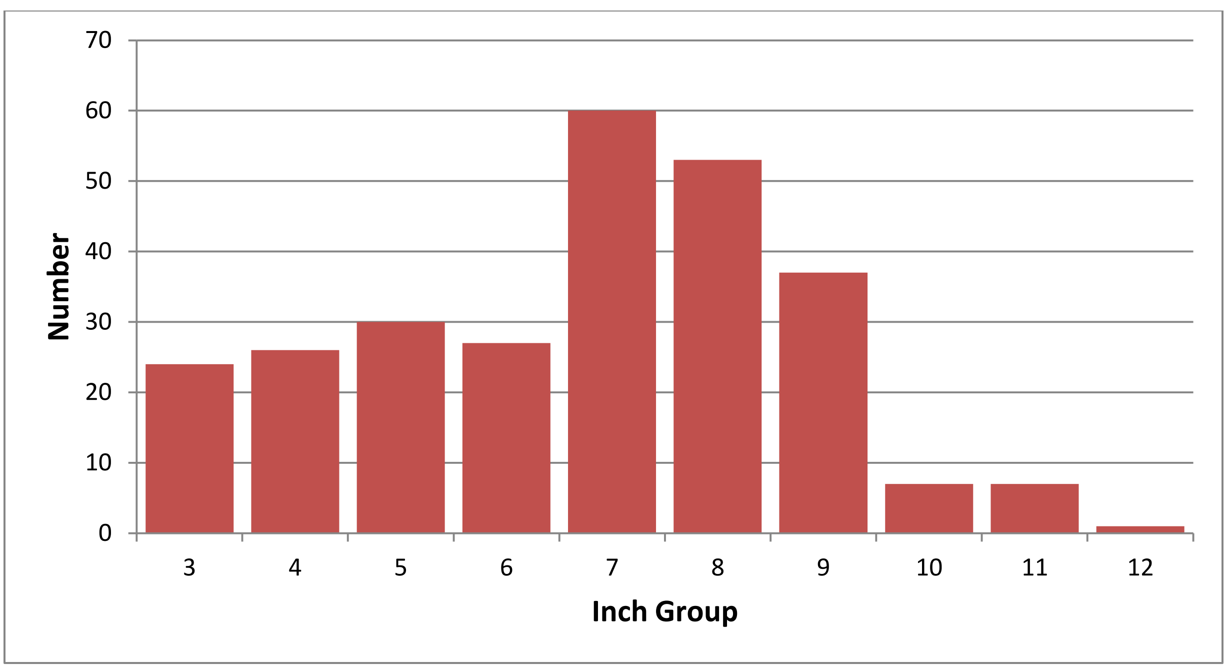


Figure 7. Black crappie size distributions (inch groups) from Lacassine Pool, LA, generated from standardized electrofishing results 2002 - 2016 (n=272).

Creel Surveys

Standardized LDWF creel surveys indicate LMB anglers are the largest user group on Lacassine Pool, comprising between 75.6% and 82.0% of all anglers annually. Sunfish (bream) anglers are the next largest user group, comprising between 6.9% and 16.3% of total anglers annually.

*Largemouth bass anglers*

Creel survey results show bass anglers expended an annual mean of 26,732 hours of effort from 1990-2011 on Lacassine Pool. While the amount of bass habitat can vary from year to year depending on rainfall, current habitat is estimated to be approximately 6,000 acres. This means there are approximately 4.5 hours of effort per acre of bass habitat (26,732 hours/6,000 acres). Eder (1984) estimates that 30 hours/acre of recreational fishing is necessary for significant impact to the size structure of a LMB population. Excluding reduced effort in 2011 due to drought conditions (Table 3), the annual mean bass angler effort is 5.1 hours per acre (30,793 hours/6,000 acres). Additionally, release rates (excluding 2004 when a 14" MLL was in effect) averaged 59.3% annually (Table 4).

Mean fishing trip lengths are between 3.75 to 4.58 hours with 3,500 to 7,600 anglers traveling between 28 to 38 miles to reach the launch annually (Table 3). While angler numbers vary from year to year, the 2011 drought significantly reduced angler effort in that year. Catch rates vary from 3.3 to 6.9 bass caught per trip, and the majority of fish released are less than 12" TL (Tables 4 and 5).

Table 3. Annual averages of angler party size, duration of fishing trip, and distance traveled from residence to boat ramp for all years of creel surveys on Lacassine Pool, LA.

| Bass Anglers | | | | |
|---|---|---|---|---|
| Year | Total # of anglers | Mean # of anglers in party | Mean length of fishing trip (hrs.) | Mean one-way distance traveled to ramp |
| 1990 | 7,540 | 1.58 | 4.58 | 32 |
| 2004* | 6,462 | 1.81 | 4.66 | 38 |
| 2008 | 6,829 | 1.78 | 4.02 | 28 |
| 2011 | 3,566 | 1.83 | 3.75 | 28 |
| *Note: 14" MLL in effect for largemouth bass this year | | | | |

Table 4. Annual catch and release statistics for largemouth bass harvested, released, and released above and below12" for all years of creel surveys on Lacassine Pool.

| Bass Anglers | | | | |
|---|---|---|---|---|
| Year | Total #LMB harvested | Total #LMB released | #LMB released below 12" (14") | #LMB released above 12" (14") |
| 1990 | 11,175 | 17,005 | 16,265 | 740 |
| 2004* | 2,251 | 35,906 | (34,346) | (1,560) |
| 2008 | 13,196 | 19,097 | 15,723 | 3,374 |
| 2011 | 6,044 | 8,643 | 5,510 | 3,133 |

*Note: 14” MLL in effect for largemouth bass this year.

Table 5. Annual catch and release statistics for largemouth bass anglers for all years of creel surveys on Lacassine Pool, LA.

| Bass Anglers | | | | |
|---|---|---|---|---|
| Year | # LMB caught per trip | #LMB released per trip | # LMB harvested per trip | Average weight of harvested LMB |
| 1990 | 4.49 | 2.87 | 1.62 | 1.17 |
| 2004* | 6.86 | 6.30 | 0.55 | 2.37 |
| 2008 | 5.69 | 2.82 | 2.86 | 1.10 |
| 2011 | 3.30 | 1.72 | 1.58 | 1.18 |
| *Note: 14” MLL in effect for largemouth bass this year. | | | | |

## HABITAT EVALUATION

### Aquatic Vegetation

Lacassine Pool was designed, and is managed, to provide vegetation species beneficial to waterfowl. The current USFWS management objective is to maintain a 50:50 open water to short vegetation ratio (USFWS 2007). Submersed aquatic plants including coontail (*Ceratophyllum demersum*), cabomba (*Cabomba caroliniana*), hydrilla (*Hydrilla verticillata*), watershield (*Brasenia schreberi*), and water lilies *(Nymphaea* spp.) cover almost 100% of open water found in Lacassine Pool. The primary emergent plant that reduces open water habitat is maidencane (*Panicum hemitomon*), which covers approximately 60% of the impoundment.

*Fish spawning habitat*

Soft, organic bottoms and accumulation of organic material limit spawning habitat for nest building fish (Centrarchids). Few nesting cavities are available for catfish. Spawning habitat is a limiting factor in Lacassine Pool.

*Juvenile fish habitat*

Aquatic plant coverage (see above) provides ample complex cover for juvenile fish. Juvenile habitat is not a limiting factor in Lacassine Pool.

*Adult fish habitat*

Maidencane (see above) and other emergent plants reduce overall aquatic habitat in Lacassine Pool. More open water would lead to increased adult habitat and increased fish populations. Adult habitat is a limiting factor in Lacassine Pool.

*Fertility*

Lacassine Pool was created by impoundment of a naturally fertile marsh. High organic loads and soil fertility provide ample nutrients for the system. Fertility is not a limiting factor in Lacassine Pool.

*Problem Vegetation*

Lacassine Pool is managed to provide maximum coverage of plants beneficial to waterfowl and migratory birds. Non-native, less beneficial aquatic vegetation such as alligator weed (*Alternanthera philoxeroides*), water hyacinth (*Eichhornia crassipes*), and both *Salvinia* species block fishing access and impact the refuge mission. Overall coverage of these plants is usually less than 10%. LDWF and USFWS work jointly to control these species. Giant salvinia (*S. molesta*) has the potential to cover significant amounts of open water habitat in the pool and currently is the primary problem.

Estimated nuisance plant coverage in Lacassine Pool as of March 2016:

Alligator weed (175 acres)
Water hyacinth (<25 acres)
Common Salvinia (20 acres)
Giant Salvinia (50 acres)

Substrate

Bottom substrates of Lacassine Pool consist primarily of Allemands muck (AE), an organic soil very fluid to 66" in depth (Figure 8). Other soil types present are Ged muck clay (GB), a mineral soil with firm clay at 60" in depth, and udifluvents (UD) consisting of hydraulically excavated soils.

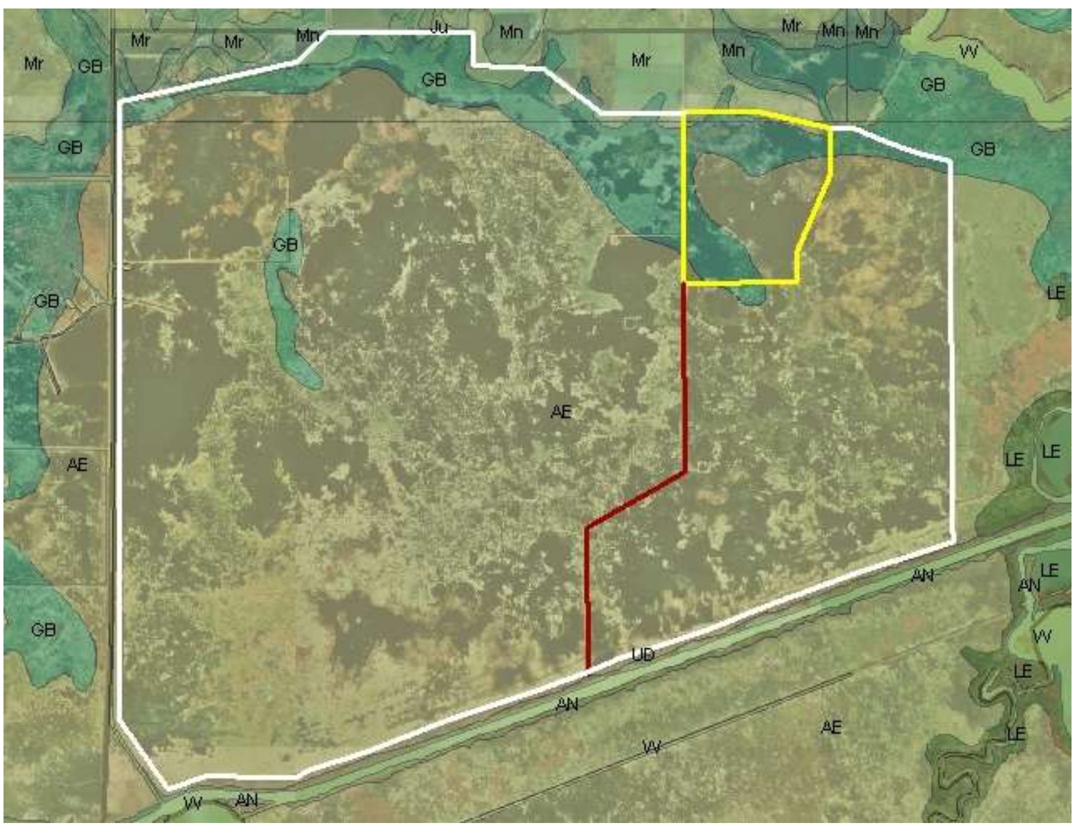


Figure 8. Soil type map of Lacassine Pool where AE=Allemands muck, GB=Ged muck clay, and UD=udifluvents.

Artificial Structure

No artificial structures are present in Lacassine Pool. Raised spawning platforms were constructed and placed in the pool by USFWS fisheries personnel in 1995. No studies were conducted to examine the benefits of these platforms, and they have all since failed and no longer function as intended.

## CONDITION IMBALANCE / PROBLEM

Open water (adult) habitat is reduced as a result of organic material accumulation. This accumulation has led to decreased water depth and the colonization of maidencane.

Soft organic materials on the bottom reduce spawning habitat and therefore spawning potential.

Due to its growth potential and the patchwork of open water present in the pool, giant salvinia has the potential to impact a significant portion of open water in Lacassine Pool.

## CORRECTIVE ACTION NEEDED

Significant reduction in accumulated organic material is needed. Drying, compaction, and burning of this material should be conducted when favorable environmental conditions are present.

Treatments of giant salvinia with foliar herbicide applications and with drawdowns; providing the percentage of areal coverage surpasses 25% at any time during the year.

# RECOMMENDATIONS

1) Work with USFWS staff to publicly promote the long term fisheries benefits of drying and burning organic material in individual pool units.

2) Continue to work with USFWS staff to provide chemical control of nuisance aquatic vegetation on Lacassine Pool under the established MOA. A mix of glyphosate (0.75 gal/acre) and diquat (0.25 gal/acre) with Turbulence (0.25 gal/acre) surfactant is recommended to target giant and common salvinia. If infestations are primarily primrose and alligator weed, imazapyr should be used at 0.5 gal/acre with Turbulence surfactant (0.25 gal/acre). Infestations consisting primarily of water hyacinth should be treated with 2,4-D at 0.5 gal/acre. Herbicides used are dependent upon USFWS supplies, funding, and approvals.

3) Continue annual monitoring of sport fisheries in Lacassine Pool as outlined in established MOA.

4) Meet annually with Refuge staff to discuss fisheries populations, problems, needs, and aquatic vegetation associated with the refuge.

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